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ORIGINAL ARTICLE

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Restorative yoga for occupational stress among Japanese female nurses working night shift: Randomized crossover trial

Yoko Miyoshi

School of Health Science, Faculty of Medicine, Tottori University, Tottori, Japan

Correspondence
Yoko Miyoshi, School of Health Science, Faculty of Medicine, Tottori University, 86, Nishi-cho, Yonago, Tottori 683-8503, Japan.
Email: miyoc.45@tottori-u.ac.jp

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Abstract

Objectives: To determine whether restorative yoga is an effective method for relieving occupational stress among female nurses working the night shift in Japan.

Methods: From July 2017 to May 2018, 20 female nurses aged in their 20s to 30s who were working the night shift at a university hospital participated in a randomized crossover trial, consisting of a 1-hour guided group yoga session followed by 4 weeks of at-home practice and 4 weeks of usual stress relief methods. The level of stress was assessed by the Brief Job Stress Questionnaire of the Ministry of Health, Labour and Welfare before and after performing restorative yoga. Descriptive statistics were calculated and data were analyzed by Student's *t* test, one-way analysis of variance (with repeated measures), or Bonferroni's multiple comparison test.

Results: Vital signs showed no significant differences from before to after the group yoga session, and there was no change of weight after 4 weeks of at-home practice. The mean questionnaire score for "psychological and physical stress reactions" was significantly reduced after the group yoga session. In addition, the mean score was significantly lower after 4 weeks of at-home practice than before or after group yoga, or after 4 weeks of the usual stress relief methods.

Conclusions: These findings suggest that restorative yoga may be effective for alleviating occupational stress among female nurses working the night shift.

KEYWORDS
brief job stress questionnaire, nurse, occupational stress, randomized crossover trial, restorative yoga

1 | INTRODUCTION

Working conditions are difficult for nurses, including the need to work the night shift.[1] The 2016 survey of The Japan Nursing Association (JNA) showed that the nursing staff turnover rate is higher at hospitals where a high percentage of nurses work long night hours.[2] In 2016, the average turnover rate for full-time nurses was 10.9% and this rate has not changed since fiscal year 2010.[2] In addition, it was reported that night shift workers show higher turnover compared with those working day shift.[3] It was also reported that depressive symptoms are correlated with job stress,[4] while the Japanese Ministry of Health, Labour and Welfare reported that the medical profession was the occupation with the second highest rate of mental illness in 2017.[5] Nurses may develop physical and psychological problems such as anxiety or depression due to occupational stress.[6] It has been reported that nurses who work rotating shifts are more likely to experience work-related stress,[7] so implementing programs and strategies to eliminate stressful working conditions in hospitals is critical

for prevention and alleviation of work stress among nurses.[8] Previous studies have demonstrated the efficacy of yoga for improving self-care and reducing burnout among nurses,[9,10] as well as potential benefits of yoga for reducing stress and muscle tension or improving self-care in nurses.[11] Previous investigation has demonstrated several benefits of yoga for female health workers, including the improvement of premenstrual symptoms, mood, and fatigue.[12] However, few studies have examined the influence of yoga on occupational stress among Japanese nurses.

Because nurses may find it difficult to practice yoga due to working the night shift, the author searched for yoga that could be done anytime and anywhere, leading to a focus on restorative yoga. This type of yoga was devised by Lasater in the 1990s,[13] who synthesized ancient knowledge and modern science based on her experience as a yoga teacher and physical therapist. Iyengar[14] previously found that pain and injury could occur when students attempted difficult yoga poses and experimented with props so that students could practice without strain, leading to the basis of restorative yoga that was subsequently expanded by Lasater.[13]

Restorative yoga typically involves adoption of only a few positions, while supported by props that allow complete relaxation and renewal.[13] Restorative yoga is passive and the body is supported with a pillow or towel to promote relaxation of the muscles and spine.[13] Restorative yoga also promotes mindfulness and activates the connection between body and heart, and does not require the flexibility or athleticism demanded by other types of yoga.[13] It is even possible to perform it in a quiet and relaxing place at work.[13] The common key techniques for all methods of stress relief are relaxing the body and concentrating on breathing.[13] When performing restorative yoga, participants breathe slowly and gently through the nose with the mouth closed.[13]

Relaxation is a standard method of coping with stress, and several investigations into the effectiveness of relaxation have revealed measurable improvement of muscle tone and circulation.[15,16] While it is possible that this type of yoga could become popular in Japan since it is supported in the USA, there is limited clinical evidence about the effectiveness of restorative yoga for alleviating stress. Therefore, this study was performed to determine whether restorative yoga was an effective method for relieving occupational stress in female nurses working the night shift.

2 | METHODS

2.1 | Participants and setting

A total of 20 full-time nurses working at the affiliated hospital of the research director's university were enrolled between July 2017 and May 2018. Inclusion criteria were: (a) nurses working the night shift for 16 hours or more per month (this was based on the revised requirements for night shift time hours under the medical service fee revision in FY2016[17]), (b) clinical practical competency level of competent or better (this is an application of the Dreyfus model[18]), and (c) age in the 20s to 30s at the time of giving informed consent (this corresponded to over 80% of nurses at the hospital). Exclusion criteria were as follows: (a) nurses receiving treatment for orthopedic disease or psychosis, (b) nurses who already knew and practiced restorative yoga, (c) nurses who were pregnant or possibly pregnant, and (d) nurses planning to use another stress relief method in addition to restorative yoga. The study was performed from July 2017 to the end of May 2018.

2.2 | Ethical considerations

This research conformed to the Declaration of Helsinki (as revised in Brazil 2013).[19] Candidate participants were given a detailed explanation of the purpose and methods of the study, the expected benefits of participation, a guarantee of anonymity, and the voluntary nature of participation. Written informed content was obtained from all participants before enrollment. All information on the participants was anonymized and de-identified prior to analysis. This study was approved by the Tottori University Faculty of Medicine Ethics Committee (approval no.1707B040).

2.3 | Data collection

2.3.1 | Measures

The Brief Job Stress Questionnaire[20-23] of the Japanese Ministry of Health, Labour and Welfare (BJSQ) consists of 57 items, which assess job stressors (17 items), psychological and physical stress reactions (29 items), and buffering factors such as social support at work (11 items). The BJSQ manual[24] proposes criteria for defining high-stress workers. In the present study, the scores for each item in "psychological and physical stress reactions" were determined on a four-point Likert scale (1 = low stress to 4 = high stress) and were totaled. The items covered by "psychological and physical stress reactions" are related to mental and physical symptoms caused by psychological problems. A work-related stress score >77 points was taken to indicate high stress according to the BJSQ definition. The internal consistency, factorial validity, and criterion-related validity of the job-related stress factors and symptom scales of the BJSQ have been demonstrated previously.[20]

2.3.2 | Demographic variables

The following variables were collected: age, years of nursing experience, number of night shifts worked per month,

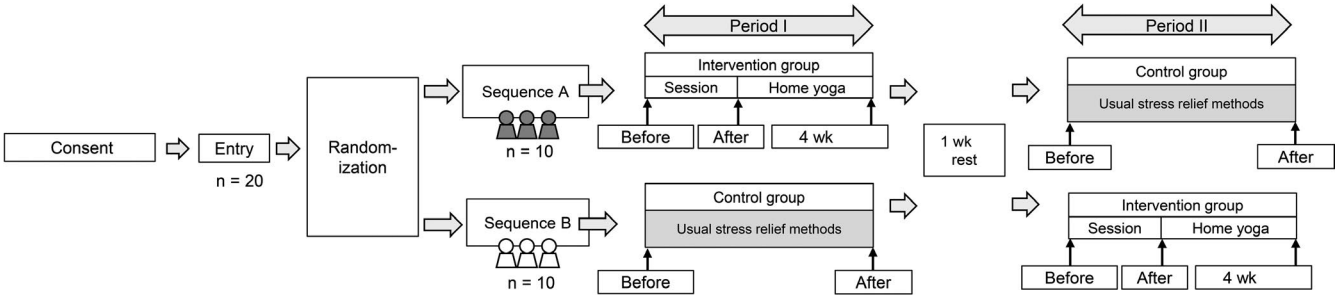

FIGURE 1 Outline of the protocol

menstrual cycle, usual stress relief methods, height, weight, blood pressure, and pulse rate.

2.3.3 | Yoga diary

Information about performing yoga was recorded in a diary by each participant. The participants recorded the day, starting time, and finishing time of each yoga session.

2.4 | Study design and procedures

This study was a randomized crossover trial that examined the effectiveness of restorative yoga. An outline of the study and the disposition of the participants enrolled are shown in Figure 1. After obtaining informed consent, participants were randomized to sequence A or sequence B. In the first period of the study, participants assigned to sequence A completed a 1-hour group session of restorative yoga with guidance from a yoga instructor and subsequently performed restorative yoga at home individually for 4 weeks, while participants assigned to sequence B used their normal stress relief methods for 4 weeks. After a 1-week washout period, the participants switched their stress relief methods in the second period of the study. That is, participants assigned to sequence A used their normal stress relief methods for 4 weeks, while participants assigned to sequence B completed a 1-hour group session of restorative yoga with guidance from a yoga instructor and subsequently performed restorative yoga at home individually for 4 weeks. At home, the participants performed restorative yoga at least 3 times a week for approximately 5 to 15 minutes each time, or for longer if they wished. The initial group session of restorative yoga was led by an experienced yoga instructor and was designed to provide participants with self-care tools to practice at home. The instructor taught the participants the basics of postural alignment using props and deep breathing, and they received a handout containing detailed information and illustrations of the five poses. Participants were taught the following five restorative yoga poses[13,25] by the instructor: Supported Bound-Angle Pose, Supported Bridge Pose, Supported Child's Pose, Reclining Twist with a Bolster, and Elevated Legs-up-the Wall Pose. The Supported Bound-Angle Pose gently stretches the legs, opens the chest, and relaxes the abdomen, and persons who have hypertension or respiratory problems often find this pose especially useful.[13,25] It is also beneficial for women during menstruation and during menopause.[13,25] The Supported Bridge Pose is a modified inversion that drains fluid from the legs, thus reducing fatigue.[13,25] It quiets the mind and relieves discomfort from sitting with the shoulders hunched forward.[13,25] This pose is also helpful for headache or mental agitation, which are often symptoms of overwork.[13] The Supported Child's Pose provides a gentle stretching of the lower back muscles,[13,25] and can be used to help ease menstrual cramps and evenly stretch the posterior spinal structures.[13,25] It is extremely restful for the mind. The Reclining Twist with a Bolster pose relieves stress in the back and flank muscles.[13] It also helps to stretch the intercostal muscles.[13] As these muscles are relaxed, breathing is enhanced.[13] The Elevated Legs-up-the Wall Pose alleviates the systemic effects of stress, relaxing the mind and refreshing the circulation and breathing.[13] It is especially beneficial for persons who have varicose veins, as well as those who have to stand for long periods, those who retain water, and those whose legs swell easily.[13] When performing yoga at home, the participants selected their favorite poses and used one pose or a combination of several as they liked.

Figure 2 shows the schedule of observations and investigations. The same BJSQ questionnaire was used each time. It was sent to the participants via the hospital messenger service and was returned the same way. All questionnaires were handled with identification.

2.5 | Data analysis

Descriptive statistics were calculated for the demographic characteristics. The internal consistency of the BJSQ was assessed by calculating Cronbach's α coefficient. Statistical analysis was carried out by initially performing the Shapiro-Wilk test to assess the normality of data. Comparison of mean values was done using Student's *t* test, one-way analysis of variance (for repeated measures), and Bonferroni's multiple comparison test. A P value $<.05$ (two-sided) was considered

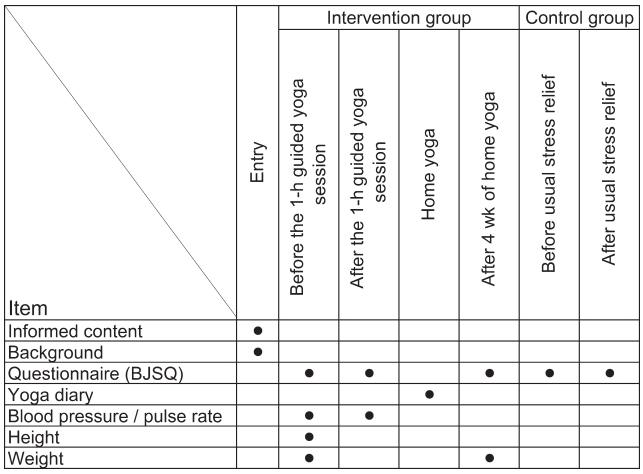

FIGURE 2 Study schedule

significant. IBM SPSS Statistics for Windows (Version 25) was used for all analyses.

3 | RESULTS

All subjects completed this study without any adverse events (symptoms or signs) during both periods of the study. None of the participants dropped out and the effective response rate to the questionnaire was 100%. Internal consistency of the BJSQ (Cronbach's alpha) was 0.95.

To evaluate the sequence effect, it was confirmed after randomization that there was no significant difference of the mean score for psychological and physical stress reactions between sequence A and sequence B ($P = .6$). Likewise, to evaluate the carryover effect, it was confirmed that there was no significant difference of the mean score for psychological and physical stress reactions in periods I and II between sequence A and sequence B ($P = .5$).

3.1 | Demographic profile

The demographic profile of the participants is presented in Table 1. Their mean age was 28.7 years, mean duration of nursing experience was 6.8 years, and mean number of night shifts per month was 9.3 shifts. The mean height and weight were 158.8 cm (range: 150.2-169.0) and 50.0 kg (range: 40.6-62.2), respectively. In 17 participants, menstruation was assessed as satisfactory. The usual stress relief methods were sleeping, shopping, and chatting with friends, and all participants recorded some method of alleviating stress (Figure 3).

TABLE 1 Demographic profile of the participants (N = 20)

	Mean	SD	Range
Age (y)	28.7	4.9	24-39
Nursing experience (years)	6.8	4.9	2-17
Night shifts/month (times)	9.3	2.4	3-12
Height (cm)	158.8	5.3	150.2-169.0
Weight (kg)	50.0	5.9	40.6-62.2

3.2 | Physical effects of restorative yoga

Before the 1-hour guided group yoga session (first yoga session) and after this yoga session, the blood pressure was 112/71 mmHg versus 106/67 mmHg and the pulse rate was 73 bpm versus 64 bpm. There were no significant differences of the blood pressure and pulse rate between before and after restorative yoga. The weight before the first yoga session and the weight after 4 weeks of performing restorative yoga was 50.0 kg and 50.5 kg, respectively, showing no significant difference (Table 2).

3.3 | BJSQ scores before and after restorative yoga

Figure 4 displays BJSQ scores for the psychological and physical stress reactions domains.

The mean score for the psychological and physical stress reactions domains of the BJSQ (mean ± SD) was 65.7 ± 10.8 (range: 48-92) before the initial 1-hour guided yoga session, and two nurses had scores >77 points that indicated high stress (92 and 89 points, respectively) (Figure 4). After the guided session, the mean score was 62.6 ± 10.6 (range: 47-87), which was significantly lower ($P = 0$) than at baseline. The scores of the two nurses also showed a decrease from baseline, although they were 87 and 82 points, respectively, and still indicated high stress. After 4 weeks of restorative yoga at home, the mean score was 56.1 ± 8.5 (range: 40-71), which was significantly lower than at baseline and also significantly lower than after the initial 1-hour guided session ($P = .01$), and none of the participants showed high stress. When using their normal stress relief methods, the mean score of the participants was 64.1 ± 12.7 (range: 45-96), which was significantly higher than after 4 weeks of restorative yoga ($P = .01$). The above-mentioned two nurses had high scores of 96 and 86 points, respectively, and were again in the high stress range.

3.4 | Yoga diary data

Based on information from the yoga diaries, the mean number of days on which participants performed restorative yoga was 14.9 days (range: 7-22 days) and the mean duration of a yoga sessions was 26.8 min (range: 3-60 min).

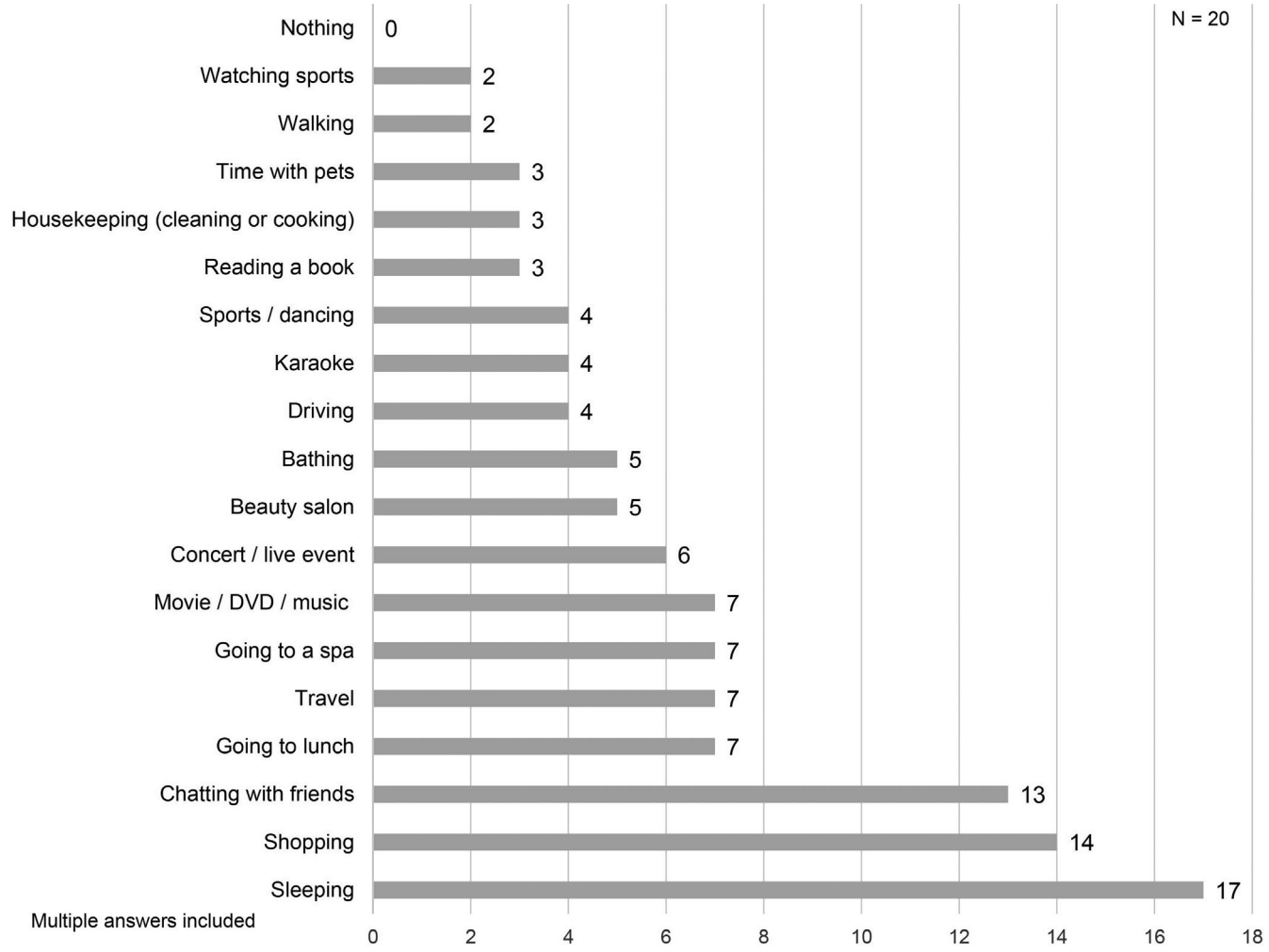

FIGURE 3 Usual stress relief methods of the participants

TABLE 2 Changes of physical characteristics between before and after the 1-hour guided group restorative yoga session (first yoga session) (N = 20)

		Mean	SD	*P* value[a]
Blood pressure (mmHg)	Before the group yoga session	112/71	8.3/8.3	n.s
	After the group yoga session	106/67	7.9/8.1	
Pulse rate (bpm/min)	Before the group yoga session	73	10.2	n.s
	After the group yoga session	64	7.9	
Weight (kg)	Before the group yoga session	50	5.9	n.s
	After 4 weeks of yoga	50.5	5.9	

[a]Student's *t* test.

4 | DISCUSSION

The present randomized crossover study was performed to determine whether restorative yoga is an effective method of relieving occupational stress among female nurses working the night shift. Benson defined the "relaxation response" as a physiological state characterized by slowing of the heart rate, metabolism, and respiration, as well as reduction of blood pressure and slowing of brain wave activity, and he considered that these changes correspond to the "relaxation response expressing the physiological and mental response when people relax consciously."[26] Restorative yoga is a

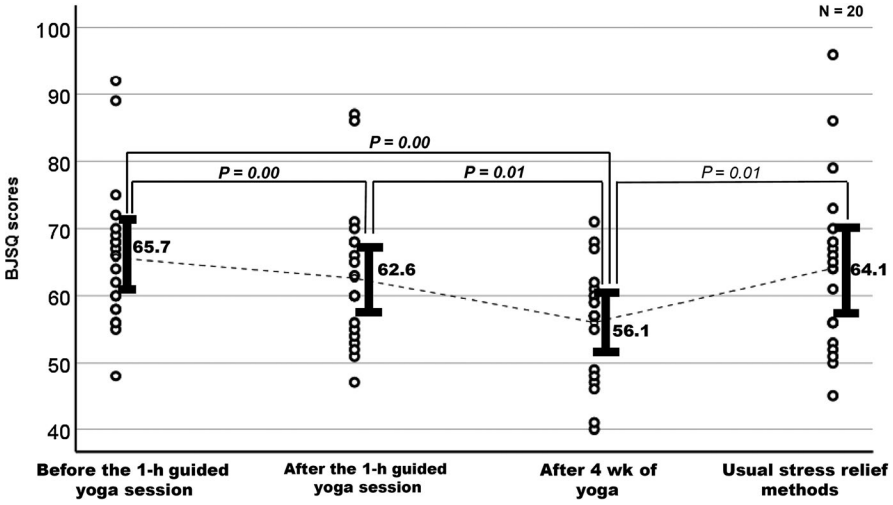

FIGURE 4 Changes of the BJSQ scores for the psychological and physical stress reactions domains. P values were determined by one-way analysis of variance (repeated measures) with Bonferroni's correction. Graph shows the mean ± SD (bold lines with bars) and individual scores. ○: Individual scores

method for relieving stress, so physiological parameters such as the vital signs and weight were investigated in the present study. However, parameters such as the blood pressure, pulse pressure, and body weight were not affected by the 1-hour guided restorative yoga session, and body weight was not altered by practicing yoga at home for 4 weeks.

In the present study, the mean BJSQ score of the nurses measured before the 1-hour guided yoga session were similar to the mean scores from other surveys.[22,27-31] Previous studies on the effects of other types of yoga have shown that a simple and regular home-based yoga program can improve the mood, fatigue, and sleep quality, as well as reducing work stress among nurses.[12,32] These findings were confirmed in the present study. After 4 weeks of restorative yoga, significant reduction of the BJSQ scores for psychological and physical stress reactions was observed among nurses working the night shift compared with baseline or with normal stress relief methods. While previous studies have shown that stress can be reduced by other methods, including laughter yoga,[10] nidra yoga,[11] and anti-aging yoga,[33] to our knowledge, this is the first evidence about the effectiveness of restorative yoga for alleviating occupational stress among female nurses working the night shift.

The present findings suggested that restorative yoga could be a self-care method for alleviating psychological and physical stress reactions. However, it should be considered that the score for "psychological and physical reactions" would not only be influenced by restorative yoga, but also by job stressors such as the frequency of shift changes, cumulative night shift days, days off after the last night shift, and weekly overtime, and would also be influenced by social support at work.[7] Although "job stressors" and "social support at work" were not investigated in this study, the influence of these factors on "psychological and physical stress reactions" should be evaluated. Accordingly, the same database is currently being used to assess these factors for a future report. Increased occupational stress among nurses with rotating shifts was reported to be related to demographic factors such as age, marital status, job tenure, job title, unit type, and hospital type.[7] While the present study analyzed the characteristics and trends of stress among nurses, it seems important to also assess such factors in future investigations.

Lasater[13] stated that "Taking time out each day to relax and renew is essential to living well." Kubo et al reported that engaging in appropriate activities on days off could facilitate recovery from work-related fatigue.[34] Lin proposed the optimization of nursing work schedules to alleviate work stress.[7] However, in 2017 the Japan Federation of Medical Worker's Unions[35] reported a steady increase in normalization of overtime work due to a severe shortage of nurses, along with a reduction of taking paid vacations and an increase of fatigue due to shift work. Therefore, it is clear that working conditions for Japanese nurses have recently become less favorable.

Lee et al[36] reported that nurses have good strategies for coping with work stress, but are under great pressure at work due to factors such as professional relationships, managerial roles, and personal responsibilities, which means that nurses are not good at achieving a health-promoting lifestyle. If nurses do not attempt to alleviate stress, it can become chronic and have an adverse impact on health, causing psychological symptoms such as fatigue and anxiety or somatic symptoms such as headache and indigestion.[20] The present study showed that restorative yoga helped to alleviate stress and allowed nurses to relax when it was performed regularly for even only 5 minutes per day. Based on the report of Hasan et al and the present results, implementation of programs that teach nurses how to deal with stress at work and improve their coping strategies is recommended.[37] Like other shift workers, nurses working the night shift may find it difficult to implement their usual stress relieving strategies due to lack of time. However, restorative yoga could be performed at any time, such as during a break or when working at night. Accordingly, none of the 20 participants dropped out of this study.

Research on the safety of yoga is equally important as exploration of its potential health benefits, since the safety of yoga has not been thoroughly investigated. A recent report suggested that yoga is beneficial for musculoskeletal conditions and mental health,[38] while another study showed that yoga was not effective for people with chronic low back pain.[39] In addition, a randomized trial revealed that yoga participants developed adverse events including chronic low back pain.[40] Thus, previous reports about the safety of yoga have varied. This appears to be the first study to examine restorative yoga, but some questions remain unanswered and further investigation is required to examine the safety and effectiveness of restorative yoga on a larger scale with a longer follow-up period.

5 | LIMITATIONS

This study had several limitations that might have affected the outcomes. First, the results have limited generalizability because the inclusion criteria limited the range of participating nurses, so further detailed investigation will be needed to determine the effectiveness of restorative yoga for reducing stress in other populations, such as older female or male nurses, other medical professionals, elderly patients with dementia, local residents, and office workers. In addition, this study was limited to assessing the effects of restorative yoga on occupational stress. Further work is needed to determine if the benefits seen in this study extend to other types of stress. A further limitation of this study is that it was conducted over a short period of time. As such, the willingness and ability of nurses to sustain this restorative yoga practice voluntarily over long periods were not assessed. Moreover, the long-term effectiveness of restorative yoga practice for stress reduction was not determined. Further study is also needed to assess whether nurses voluntarily adopt restorative yoga as a stress relief method despite difficult working hours, and how to best provide nurses with information about this yoga method. Another shortcoming of this study was that participants performed yoga at home without monitoring. It was therefore impossible to evaluate whether the participants practiced restorative yoga as taught, and it was also unclear whether or not participants who learned restorative yoga in the first period of the study continued to practice it during the subsequent control period. Finally, it should be kept in mind that effect estimates tend to be exaggerated in studies with subjective outcomes when blinding is not performed.[41]

6 | CONCLUSION

This randomized crossover trial investigated the effect of restorative yoga on occupational stress among female nurses working the night shift. Restorative yoga significantly reduced the BJSQ score for psychological and physical stress reactions, indicating that it was an effective stress reduction technique, even when performed briefly. Restorative yoga is a simple practice that can be carried out at any time and place. Accordingly, restorative yoga may be useful for alleviating occupational stress among female nurses working the night shift.

ACKNOWLEDGEMENTS

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DISCLOSURES

Approval of the research protocol: This study was approved by the Tottori University Faculty of Medicine Ethics Committee (approval no.1707B040). *Informed consent*: This research conformed to the Declaration of Helsinki (as revised in Brazil 2013). Written informed content was obtained from all participants before enrollment. *Registry and registration no. of the study*: This clinical trial was registered in the UMIN Clinical Trials Registry (R000032811UMIN000028725). *Animal studies*: N/A. *Conflict of interest*: The author declares there are no conflicts of interest for this article.

AUTHOR CONTRIBUTIONS

YM was responsible for the study design, data collection and analysis, and manuscript writing.

ORCID

Yoko Miyoshi https://orcid.org/0000-0001-6791-4104

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